

Title: Creating simulated microgravity patient models

Authors: Victor Hurst IV (Ph.D.), Harold K. Doerr (M.D.), Kira Bacal (M.D., Ph.D., FACEP)

Introduction: The Medical Operational Support Team (MOST) has been tasked by the Space and Life Sciences Directorate (SLSD) at the NASA Johnson Space Center (JSC) to integrate medical simulation into 1) medical training for ground and flight crews and into 2) evaluations of medical procedures and equipment for the International Space Station (ISS). To do this, the MOST requires patient models that represent the physiological changes observed during spaceflight. Despite the presence of physiological data collected during spaceflight, there is no defined set of parameters that illustrate or mimic a 'space normal' patient.

Methods: The MOST culled space-relevant medical literature and data from clinical studies performed in microgravity environments. The areas of focus for data collection were in the fields of cardiovascular, respiratory and renal physiology.

Results: The MOST developed evidence-based patient models that mimic the physiology believed to be induced by human exposure to a microgravity environment. These models have been integrated into space-relevant scenarios using a human patient simulator and ISS medical resources.

Discussion: Despite the lack of a set of physiological parameters representing 'space normal,' the MOST developed space-relevant patient models that mimic microgravity-induced changes in terrestrial physiology. These models are used in clinical scenarios that will medically train flight surgeons, biomedical flight controllers (biomedical engineers; BME) and, eventually, astronaut-crew medical officers (CMO).